A.P. Calculus

Related Rates Guidelines

See over for an example!

1. Read and understand the general sense of the problem. Understand what the question is that is being asked.

2. Draw a picture or diagram. You should get in the habit of doing this for any problem where some kind of diagram, no matter how simple, is possible. Also, copy all relevant and known information onto the page and onto the diagram.

3. Identify the two measures that are changing in the problem. Give each a label. If you are given the rate of change of one measure, identify it as a derivative: for example, if the volume is changing with respect to time at 5 m3/min., write *dV/dt = 5* m3/min.

4. Define an equation that relates the two measures. These most often will be equations that draw on geometric relations such as area, volume and relative distances, or trigonometric relations. If there are more than two variable quantities in the equation, you must find a way to substitute one out so that the equation is in only the two key measures.

5. Differentiate. Using chain rule and implicit differentiation, differentiate both sides of the equation with respect to time.

6. Substitute values for quantities and rates of change that you know. Solve for the unknown quantity or rate of change.

7. Translate your answer. Does it answer the question that was posed? What are the units? Does the answer make sense in its context?

The ladder problem: A ladder is leaning against a wall. The bottom of the ladder is *1.5* meters from the base of the wall at *t = 0*. The base of the ladder is slipping away from the wall at a rate of *0.8* meters/second. What is the velocity of the top of the ladder at *t = 1* sec.

1. Read and Understand. OK, leaning ladder sliding out from the wall, top sliding down the wall. We want to know the velocity of the top of the ladder, so its change of position with respect to time.

2. Picture.

1.5 m

T 3. Identify the two measures. The first is the location of the base, we’ll call it B. The second is the top of the ladder, we’ll call it T.

ladder -- 5 meters

wall

4. Find the equation that relates

B

the two measures. We are talking about the location of B and T from the base of the wall. We have a right triangle, so *B2 + T2 = L2* where L is the ladder and the hypotenuse of our right triangle. The question asks for the velocity of the top, let’s solve for *T.*



5. Differentiate. Keep in mind that *L2* is just *25* because *L* is *5*:



6. Substitute values. We know that we want the speed of T when B = 1.5, and :

